

## REMARKS

### Amendments

5           In the specification, page 1, lines 19-20, has been amended to incorporate by  
reference the U.S. patents referred to, and page 10 has been amended to recite  
explicitly the oils referred to at column 3, line 37, to column 4, line 4, of U.S. Patent No.  
5, 736,125. Basis for this amendment will be found in that passage in U.S. Patent No.  
5, 736,125. U.S. Patent No. 5, 736,125 is of record, but for the Examiner's  
10   convenience, a copy of the relevant page is attached.

          Claim 1 has been amended to state that the SCC polymer is present in amount  
such that it thickens the oil. The significance of this requirement will be made clear  
below in the discussion of the rejections under 35 U.S.C. 102 and 103. In addition,  
15   Claim 1 has been amended to remove the references to the temperatures  $T_s$ ,  $T_p$  and  
 $T_o$ , since the values of these temperatures do not form part of Claim 1.

          Claim 2 has been amended to provide antecedent basis for values of the  
temperatures  $T_s$  and  $T_p$  recited therein. Claim 5 already provides antecedent basis for  
20   the value of  $T_o$  recited therein.

          Claim 6, which the Examiner found to be allowable, has been rewritten in  
independent form. The scope of Claim 6 is unchanged by these amendments.

25           Claim 7, which was allowed, but which was dependent on rejected Claim 9, has  
been rewritten in independent form. The scope of Claim 7 is unchanged by this  
amendment

          Claim 8 has been canceled. However, new Claim 29 is similar to Claim 8.  
30

Claim 9, which is an independent Claim, has been amended (like Claim 1) to state that the SCC polymer is present in amount such that it thickens the oil.

5 Claim 13, which was allowed, but which was dependent on rejected Claim 9, has been rewritten in independent form. The scope of Claim 13 is unchanged by this amendment

Claim 14 has been made dependent on Claim 13, instead of Claim 9.

10 Claim 20, which is an independent Claim, has been amended (like Claim 1) to state that the SCC polymer is present in amount such that it thickens the oil.

New claims 21-46 have been added.

15 New claim 21 is an independent Claim which is similar to original Claim 1, but requires that the composition is water-free and contains at least 2% by weight, based on the weight of the oil, of an SCC polymer as defined. Basis for this amendment is on page 10, lines 16-17. New claims 22-25 are dependent (directly or indirectly) on claim 21 but are otherwise substantially the same as claims 2 -5.

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New claim 26 is an independent Claim which is similar to original Claim 1, but requires that the composition is a water-in-oil or oil-in-water emulsion Basis for this amendment is on page 3, lines 19-20, and page 10, lines 13-14. New claims 27-31 are dependent (directly or indirectly) on claim 26. Claims 27-30 are substantially the same  
25 as original claims 2,3,8 and 5. Claim 31 requires that the composition contains at least 0.5% by weight of the SCC polymer, based on weight of composition. Basis for this requirement is on page 10, lines 17-18.

30 New claim 32 is an independent Claim which is similar to original Claim 1, but requires that the oil in the composition is selected from the group consisting of mineral oils; vaseline oils; hydrogenated polyisobutylene; triglycerides; oily esters derived from a

long-chain acid or a long-chain alcohol or both; animal oils; silicone oils; long chain alcohols; esters derived from lanolic acid; and acetyl glycerides. Basis for this amendment is on page 10, lines 23-25, which notes that "suitable oils are disclosed for example at column 3, lines 37, to column 4, line 4, of U.S. Patent No. 5,736,125". U.S.

5 Patent No. 5,736,125 is of record, but for the Examiner's convenience, a copy of the relevant page that Patent is attached. The specification has been amended to provide a counterpart for Claim 32. New claims 33-36 are dependent (directly or indirectly) on claim 32 but are otherwise substantially the same as claims 2-5.

10 New claims 37-44 are dependent claims based on the disclosure on page 2, line 17 -- page 3, line 4.

New Claim 45 is an independent Claim which is similar to original Claim 1, but requires that the SCC polymer consists essentially of the repeating units defined in  
15 Claim 45. One of the repeating units is derived from hydroxyethyl acrylate. Thus the definition of the SCC polymer is in this respect similar to, but narrower than, the definition in Claim 15. Basis for Claim 45 will be found on page 7, line 12 -- page 8, line 9. New Claim 46 is dependent on Claim 45,, and is similar to original Claim 16.

20 The Rejections under 35 U.S.C. 102 and 35 U.S.C. 103

Applicants respectfully traverse the rejection of claims are 1-5, 8-12 and 20 under 35 U.S.C. 102 as anticipated by, or under 35 U.S.C. 103 as obvious over, Mueller (U.S. Patent No. 5, 281,329), insofar as the rejection is applicable to the amended claims, for  
25 following reasons.

Mueller relates to the treatment of an oil which is a crude oil, vacuum gas oil or residual oil. Such oils contain substantial quantities of paraffins. The paraffins dissolve in the oil at higher temperatures, but crystallize out on cooling, thus lowering or  
30 preventing the ability of the oils to flow at low temperatures. In Mueller's Examples, the oils have pour points of 6-30 °C. (the pour point is the temperature below which the oil

will not flow). Mueller's objective is to reduce the pour point of the oil. He does this by dissolving into the oil an additive which is a mixture of a relatively low melting SCC polymer and a relatively high melting SCC polymer. The quantity of the additive is very small. A range of 1-10,000 ppm (0.001-1%) is given, with a preferred range of 0.005-0.2%. In the Examples, the amounts used are 4-1,000 ppm (0.004-0.1%). According to Mueller, the additive is "incorporated in the growing paraffin crystals and in this way hinders the further growth of the crystals and the formation of extended crystal conglomerates" (column 1, lines 26-30). Mueller does not disclose any compositions containing water.

From this summary of Mueller, it will be apparent that Mueller's objective is the very reverse of Applicants' objective. Mueller takes an oil that is thick and makes it fluid. Applicants take an oil that is fluid and make it thick.

In Its broadest aspects, this invention includes compositions which comprise (i) a paraffin-containing oil as specified by Mueller, and (ii) a mixture of SCC polymers as specified by Mueller. However, the amendments made to the claims make it clear that even Applicants' broadest claims do not include anything disclosed by Mueller. Thus, the requirement that the SCC polymer is used "in amount such that it thickens the oil" clearly excludes everything disclosed by Mueller, whose sole purpose is to make the oil more fluid.

A comparison of Mueller and the present application makes it clear that Applicants use substantially greater quantities of the SCC polymer than Mueller, and that as a result, Applicants achieve a result which is the opposite of that achieved by Mueller. For example, the minimum amount of SCC polymer explicitly disclosed in this application, for compositions which (like Mueller's) are free of water, is 2%, i.e. twice the maximum disclosed by Mueller and 20 times the maximum amount used in any of Mueller's specific examples. Page 10, lines 14-18, notes that it is "usually unnecessary" to use more than 10 % of the SCC polymer and that smaller amounts are often effective. Applicants' Examples use 5 % of the SCC polymer. Those skilled in the art

will have no difficulty, having regard to their own knowledge and the disclosure in this application, in selecting SCC polymers and amounts thereof which will achieve the desired result of thickening the oil.

5           The Examiner's comment that "All properties are inherent in the composition" (i.e. the composition disclosed in the Mueller) is of course correct in relation to a claim to a composition in which the relative amounts of the oil and the SCC polymer are not specified. However, it is not correct in relation to the amended claims, in which the proportions of the oil and the SCC polymer are functionally limited in a way that is  
10 directly contrary to Mueller's mandatory requirements.

          It is submitted, therefore, that the rejection under 35 U.S.C. 102 must be withdrawn, since Mueller nowhere discloses a composition in which the presence of the SCC polymer results in thickening of the oil. It is further submitted that, since  
15 Mueller's sole objective is to provide a composition in which the SCC polymer **increases** the pourability of the oil, the rejection under 35 U.S.C. 103 should also be withdrawn, since it cannot be obvious to modify Mueller in a way that is directly contrary to Mueller's instructions, i.e. so as to **decrease** the pourability of the oil.

20           The Examiner has already noted that a number of the claims originally filed (namely claims 6, 7, and 13-19, which the Examiner allowed or merely objected to) contain limitations that provide a clear distinction over Mueller. A number of the newly added claims likewise contain limitations that provide clear, additional, non-functional, distinctions over Mueller, and Applicants contend that those claims are independently  
25 patentable, even if claims 1 and 20 are not patentable. The claims in question are: -

          Claim 21       which requires the use of at least 2% of the SCC polymer

          Claim 26       which requires that the composition is a water-in-oil or oil-in-water emulsion

          Claim 32       which requires that the oil is an oil of one of the specified classes  
30 (which do not include the oils disclosed by Mueller)

Claim 45      which requires that the SCC polymer contains units derived from  
hydroxyethyl acrylate

#### PETITION

5

On October 25, 2001, Applicant mailed a paper entitled Petition to Add  
Additional Priority Claim under 37 CFR 1.55, together with a Declaration and Power of  
Attorney setting out the two priorities claimed for this application, namely priority under  
35 U.S.C. 120 from U.S. Serial No. 09/398,377, filed Sept. 17, 1999, and priority under  
10 35 U.S.C. 119 from International Application No. PCT/U.S. 00/40780, filed August 30,  
2000. The specification originally filed with this application correctly states, on page 1,  
lines 5-9, that those two priorities are claimed. However, the Declaration filed with the  
application did not referred to either of these priorities, and the transmittal letter referred  
only to the U.S. priority. The Office issued a Filing Receipt listing the U.S. priority only.  
15 The Petition and the revised Declaration were filed in order to claim the priority of the  
PCT application under 35 U.S.C. 119.

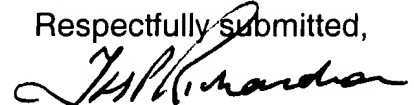
Reviewing the Petition, it has been noted that it incorrectly states that the priority  
claim (to the PCT application under 35 U.S.C. 119) was "made after the filing date and  
20 subsequent publication of the application on August 30, 2001". Since the application did  
expressly and correctly set out (on page 1 of the specification) the priorities that were  
claimed, the Petition should more correctly have stated that the Declaration filed with  
the application mistakenly omitted reference to the priorities explicitly set out in the  
specification, and that a revised Declaration was being filed in order to correct that  
25 mistake.

If the Examiner (or other person responsible for responding to the Petition)  
requires further information or action in order to confirm that both priorities have now  
been properly claimed, please contact the undersigned by telephone.

## A CONCLUSION

It is believed that this application is now in condition for allowance, and such action at an early date is earnestly requested. If, however, there are any outstanding  
5 issues that could usefully be discussed by telephone, the Examiner is asked to call the undersigned.

Respectfully submitted,



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Docket No. 12969-1

5 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bitler

Group Art Unit: 1714

Serial No.: 09/810,920

Examiner: Peter Szekely

10

Filing Date: March 16, 2001

Title: Polymeric Thickeners for Oil-containing Compositions

15

**VERSION OF AMENDED PARAGRAPHS AND/OR SECTIONS OF THE  
SPECIFICATION WITH MARKINGS TO SHOW CHANGES REQUESTED BY  
THE ACCOMPANYING REPLY, FILED IN ACCORDANCE WITH 37 CFR  
1.121(b)(1) AND (2).**

20

This paper sets out a version of each of the paragraphs rewritten as requested by the accompanying Reply, marked up to show all the changes relative to the previous version of the paragraph. In this version, the changes are shown by brackets (for deleted matter) and underlining (for added matter).

25

1. The paragraph beginning on page 1, line 19 (with the words "U.S. Patent Nos. 4,057,622 .....") and ending on page 1, line 29 (with the words "..... an oil.) has been rewritten to incorporate the changes shown below

30

-- U.S. Patent Nos. 4,057,622, 4,057,623, 4,057,624, 5,318,995, 5,519,063 and 5,736,125 disclose the possibility of thickening oil-containing compositions with certain polymers containing (a) lipophilic groups (e.g. in units derived from long chain

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On February 28, 2002

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n-alkyl acrylates) and (b) certain other groups, namely amido groups (in units derived from acrylamide), pyrrolidino groups (in units derived from N-vinyl pyrrolidone), imidazole groups (in units derived from N-vinyl imidazole), carboxylic acid and carboxylic acid salt groups (e.g. in units derived from acrylic or methacrylic acid), sulfonic acid groups, and sulfonic acid salt groups. The disclosure of each of those U.S. patents is incorporated by reference herein for all purposes. Japanese Kokai No. 4-10054 discloses non-aqueous compositions containing (A) a fluoropolymer containing a perfluoroalkyl group and an alkyl group, either or both of which may be a long chain group, (B) a liquid perfluoroalkyl organic compound, and (C) an oil. To --

2. The paragraph beginning on page 10, line 22 (with the words "The new polymeric thickeners.....") and ending on page 10, line 27 (with the words "..... WO 00/04787.") has been rewritten to incorporate the changes shown below

-- The new polymeric thickeners are effective with a broad range of oils. Suitable oils include mineral oils; vaseline oils; hydrogenated polyisobutylene; triglycerides; oily esters derived from a long-chain acid or a long-chain alcohol or both; animal oils; silicone oils; long chain alcohols; esters derived from lanolic acid; and acetyl glycerides, as disclosed [are disclosed, for example,] at column 3, line 37, to column 4, line 4, of U.S. Patent No. 5,736,125. For thickening silicone oils, it is preferred to use an SCC polymer containing units derived from a monomer containing silicon, for example a block copolymer containing SCC blocks and polysiloxane blocks. SCC/polysiloxane polymers of this type are described for example in WO 93/07194 and WO 00/04787. --

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Docket No. 12969-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant: Bitler

Group Art Unit: 1714

Serial No.: 09/810,920

Examiner: Peter Szekely

10 Filing Date: March 16, 2001

Title: Polymeric Thickeners for Oil-containing Compositions

15

**VERSION OF AMENDED CLAIMS WITH MARKINGS TO SHOW  
CHANGES REQUESTED BY THE ACCOMPANYING REPLY, FILED IN  
ACCORDANCE WITH 37 CFR 1.121(c)(1)(ii).**

20

This paper sets out a version of each of the claims rewritten as requested by the accompanying Reply (but not the claims which were unchanged or which were canceled or added by the Reply), marked up to show all the changes relative to the previous version of the claim. In this version,

25

- (i) a parenthetical expression (which is the same as the parenthetical expression in the clean version of claims set out in the Reply) follows the claim number and indicates the status of the claim as amended, and
- (ii) the changes are shown by brackets (for deleted matter) and underlining (for added matter).

30

1. (Amended) A thickened oil composition which [is at a temperature  $T_s$  and which] comprises

- (1) an oil, and

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On February 28, 2002

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Signature

(2) uniformly dispersed in the oil as a crystallized solid, a side chain crystalline (SCC) polymer which

(a) [has a crystalline melting point,  $T_p$ , and an onset of melting temperature,  $T_o$ , and

5 (b) ]is substantially free of fluorine atoms, carboxylic acid groups, carboxylic acid salt groups, sulfonic acid groups, sulfonic acid salt groups, amido groups, pyrrolidino groups and imidazole groups; and

(b) is present in amount such that it thickens the oil.

10

2. (Amended) A composition according to Claim 1, [wherein] which is at a temperature  $T_s$ , where  $T_s$  is from 15 to 25 °C, and wherein the SCC polymer has a crystalline melting point,  $T_p$ , which is 10 to 30 °C above  $T_s$ .

15 6. (Amended) A thickened oil composition [according to Claim 1 wherein the SCC polymer] which comprises

(1) an oil, and

(2) uniformly dispersed in the oil as a crystallized solid, a side chain crystalline (SCC) polymer which

20 (a) is substantially free of fluorine atoms, carboxylic acid groups, carboxylic acid salt groups, sulfonic acid groups, sulfonic acid salt groups, amido groups, pyrrolidino groups and imidazole groups; and

25 (b) contains 10-30% by weight of repeating units containing hydroxyl groups.

7. (Amended) A thickened oil composition [according to Claim 1 wherein the SCC polymer] which comprises

(1) an oil, and

(2) uniformly dispersed in the oil as a crystallized solid, a side chain crystalline (SCC) polymer which

(a) has a crystalline melting point,  $T_{p1}$  of 40-50 °C.; [ , and]

(b) consists essentially of

(ii) 70-99% by weight of repeating units derived from at least one n-alkyl acrylate or methacrylate ester in which the n-alkyl group contains 16 to 22 carbon atoms,

(ii) 1-30% by weight of repeating units derived from at least one acrylate or methacrylate ester in which the ester group contains a hydroxyl-substituted alkyl group containing less than 12 carbon atoms, and

(iii) 0-30% by weight of repeating units derived from at least one acrylate or methacrylate ester in which the ester group contains an unsubstituted alkyl group containing less than 16 carbon atoms.

9. (Amended) A thickened oil composition which comprises

(1) an oil, and

(3) dispersed in the oil, a polymer which

(a) has a crystalline melting point,  $T_p$ , and an onset of melting temperature,  $T_o$ , such that  $T_p - T_o$  is less than  $T_p^{0.7}$ ;

(b) is soluble in the oil at temperatures above  $T_p$ ,

(c) has been dispersed in the oil by a process which comprises  
(i) dissolving the polymer in the oil at a temperature above  $T_p$ , and

(ii) cooling the solution to crystallize the polymer in the oil,

[and]

(d) is a side chain crystalline (SCC) polymer which is substantially free of fluorine atoms, carboxylic acid groups, carboxylic acid salt groups, sulfonic acid groups, sulfonic acid salt

groups, amido groups, pyrrolidino groups and imidazole groups;  
and

(e) is present in amount such that it thickens the oil;

5 the composition being at a temperature  $T_s$  which is below  $T_p$ .

14. (Amended) A composition according to Claim 13 [9] wherein the SCC polymer  
contains 10-30% by weight of the repeating units derived from at least one acrylate or  
10 methacrylate ester in which the ester group contains a hydroxyl-substituted alkyl group  
containing less than 12 carbon atoms.

20. (Amended) A method of making a thickened oil composition comprising an oil  
15 and, dispersed in the oil, a side chain crystalline (SCC) polymer which

(a) has a crystalline melting point,  $T_p$ , and an onset of melting temperature,  
 $T_o$ , such that  $T_p - T_o$  is less than  $T_p^{0.7}$ , and

(b) is substantially free of fluorine atoms, carboxylic acid groups, carboxylic  
acid salt groups, sulfonic acid groups, sulfonic acid salt groups, amido groups,  
20 pyrrolidino groups and imidazole groups;

the method comprising

(i) dissolving the SCC polymer in the oil at a temperature above  $T_p$ , and

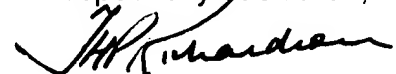
(ii) cooling the solution to crystallize the polymer in the oil;

the amount of the SCC polymer being such that, after step (ii), it thickens the oil.

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carboxylic diacid. The unsaturated carboxylic monoacids include acrylic acid, methacrylic acid, and crotonic acid. The unsaturated carboxylic diacids include maleic acid and itaconic acid. The monoesters and monoamides are derived from alcohols or amines containing from 1 to 22 carbon atoms, respectively. Of particular use in the instant invention are acrylic acid and methacrylic acid.

Copolymers which have an acidity from about 0.1 to about 4.0 meq/g. particularly from about 0.4 to about 2.0 meq/g. are of use in this application. Copolymers with a molecular weight greater than 50,000, particularly in the range of about 50,000-200,000 daltons are also of use in this application.

Any one of the copolymers described above, or a blend of at least two, may be used in the instant invention. Those copolymers of alkyl acrylate or methacrylate and acrylic acid or methacrylic acid are particularly useful in the instant invention, more particularly docosyl ( $C_{22}$ ) acrylate/styrene/acrylic acid and stearyl acrylate/methacrylic acid.

In the compositions, the amount of thickening copolymer, as defined above, is present in an amount sufficient to thicken the composition to the desired thickness. In general, it is present in an amount of from about 0.1% to about 12%, particularly from about 0.5 to about 10% by weight of the oil. If the composition is a neat composition, the thickening copolymer is present in an amount particularly from about 2 to about 8% by weight of the oil. Neat composition, as used herein, is intended to mean a composition which is essentially free of water. If the composition is an emulsion composition, the thickening copolymer is present in an amount particularly from about 0.5 to about 3.5% by weight of the oil. The composition may be thickened to the desired viscosity which is dependent upon the functional properties of the composition.

To thicken the oil phase, the copolymer is generally heated to above its melting point in the oil so as to allow it to more readily solubilize. Often, agitation is provided to further facilitate solubilization.

The oily phase is constituted by any oil or mixtures of oils conventionally employed in formulations and known in the art. The oils include, but are not limited to:

hydrocarbons, including the mineral oils, such as the paraffin oils, the vaseline oils, hydrogenated polyisobutylene, such as that commercially available from the firm of NIPPON OIL under the trademark PARLEAM, the branched hydrocarbons, such as those commercially available under the name ISOPAR;

the triglycerides, especially the vegetable oils, such as sunflower seed oil, sesame seed oil, rapeseed oil, sweet almond oil, calophyllum oil, palm oil, avocado oil, jojoba oil, olive oil, castor oil, or the grain germ oils, such as wheat germ oil;

various oily esters derived from a long-chain acid and/or alcohol, such as purcellin oil, isopropyl, butyl or cetyl myristate, isopropyl, butyl octyl, hexadecyl or isocetyl stearate, decyl oleate, hexyl laurate, propylene glycol dicaprylate, diisopropyl adipate, and the mixtures of  $C_{12}$ - $C_{15}$  benzoic esters commercially available under the tradename FINSOLV TN from the firm of WITCO;

the animal oils, such as perhydrosqualene;

the silicone oils, such as the dimethylpolysiloxanes, phenyldimethicones, cyclomethicones, and alkyl dimethicones;

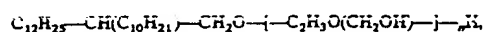
the long-chain alcohols, such as the oleyl, linoleyl, linolenyl, and isostearyl alcohols, or octyl dodecanol; the esters derived from lanolic acid, such as isopropyl or stearyl lanolate; and

the acetyl glycerides, the octanoates and decanoates of alcohols, or of polyalcohols (especially of glycol or glycerol), and the ricinoleates of alcohols or of polyalcohols, e.g., cetyl ricinoleate.

In general, the instant copolymers are soluble in oils with the exception of certain silicone oils used alone. When the copolymer is not sufficiently soluble in oil, it may be possible to attain the desired viscosity as described above by using an organic cosolvent which is compatible with cosmetologic use. Representative cosolvents include, but are not limited to, ethanol, propanol, isopropanol, glycerol, and propylene glycol. The co-solvent is usually added directly to the oil and, in the case of an emulsion, before mixing with aqueous phase of the emulsion. Generally, the amount of co-solvent is not greater than 30 volume percent relative to the volume of the oil.

The instant copolymers can be used to thicken the oil in a composition of any form, including without limitation water-in-oil emulsions, oil-in-water emulsions, anhydrous compositions, and gelled oils.

The instant copolymers can be used to thicken compositions containing a water-in-oil type emulsion. When the instant copolymers are used in this type of system, a conventional emulsifying agent or surfactant may be added to provide a stable emulsion. Any emulsifying agent known in the art and compatible with cosmetologic usage may be employed in the instant invention. Such agents include, but are not limited to, glycerol isostearate such as IMITOR 780K (commercially available from Dynamit Nobel) and polyglycerol ethers having the formula:



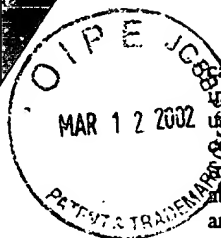
wherein  $n$ =an integer from 2 to 15 and described for example in French patent application 87.00 878 (2.593.509). The amount of the emulsifying agent is known in the art, but is generally in the range of up to about 15% by weight of the composition.

The instant copolymers may also be used to thicken compositions of the neat type; that is, those compositions which do not contain a substantial amount of water. Such neat compositions include, for example, creams and gels.

The compositions of the instant invention further may optionally contain a rheology control agent to improve the properties of the thickened oil composition if deemed necessary or desirable. This especially applies to the case in which the composition obtained is too viscous and tends to be brittle or is less viscous but not pliable enough and very fluid. These rheology control agents are known in the art and in general are nonionic amphiphilic agents having an HLB value between about 12 and about 40. They are preferably used in the presence of water or a water-soluble alcohol. The rheological control agents include: the esters of fatty acids and polyoxyethylene sorbitan; the esters of fatty acids and polyoxyethylene glycerol; the esters of fatty acids and polyoxyethylenepropylene glycerol; the polyoxyethylene or polyoxypropylene alkyl ethers; the polyoxyethylene or polyoxypropylene alkyl phenyl ethers; and the polyoxyethylene Guerbet alcohols.

When the compositions of the instant invention are cosmetic compositions, they may optionally contain additives conventionally used in the cosmetic industry, including but not limited to active ingredients, perfumes, preservatives, and sunscreen agents. These additives and their use in cosmetic compositions are well known in the art and can be added by known techniques before, during, or after the thickening of the oil.

Various active lipophilic substances which are beneficial for the skin, such as tocopherol and its esters, the fatty esters of ascorbic acid, 18- $\beta$ -glycyrhethinic acid, the ceramides, screening substances absorbing ultraviolet light, antioxidants, etc., also may optionally be incorporated in the oils.



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carboxylic diacid. The unsaturated carboxylic monoacids include acrylic acid, methacrylic acid, and crotonic acid. The unsaturated carboxylic diacids include maleic acid and itaconic acid. The monoesters and monoamides are derived from alcohols or amines containing from 1 to 22 carbon atoms, respectively. Of particular use in the instant invention are acrylic acid and methacrylic acid.

Copolymers which have an acidity from about 0.1 to about 4.0 meq/g, particularly from about 0.4 to about 2.0 meq/g, are of use in this application. Copolymers with a molecular weight greater than 50,000, particularly in the range of about 50,000-200,000 daltons are also of use in this application.

Any one of the copolymers described above, or a blend of at least two, may be used in the instant invention. Those copolymers of alkyl acrylate or methacrylate and acrylic acid or methacrylic acid are particularly useful in the instant invention, more particularly docosyl ( $C_{22}$ ) acrylate/styrene/acrylic acid and stearyl acrylate/methacrylic acid.

In the compositions, the amount of thickening copolymer, as defined above, is present in an amount sufficient to thicken the composition to the desired thickness. In general, it is present in an amount of from about 0.1% to about 12%, particularly from about 0.5 to about 10% by weight of the oil. If the composition is a neat composition, the thickening copolymer is present in an amount particularly from about 2 to about 8% by weight of the oil. Neat composition, as used herein, is intended to mean a composition which is essentially free of water. If the composition is an emulsion composition, the thickening copolymer is present in an amount particularly from about 0.5 to about 3.5% by weight of the oil. The composition may be thickened to the desired viscosity which is dependent upon the functional properties of the composition.

To thicken the oil phase, the copolymer is generally heated to above its melting point in the oil so as to allow it to more readily solubilize. Often, agitation is provided to further facilitate solubilization.

The oily phase is constituted by any oil or mixtures of oils conventionally employed in formulations and known in the art. The oils include, but are not limited to:

hydrocarbons, including the mineral oils, such as the paraffin oils, the vaseline oils, hydrogenated polyisobutylene, such as that commercially available from the firm of NIPPON OIL under the trademark PARLEAM, the branched hydrocarbons, such as those commercially available under the name ISOPAR;

the triglycerides, especially the vegetable oils, such as sunflower seed oil, sesame seed oil, rapeseed oil, sweet almond oil, calophyllum oil, palm oil, avocado oil, jojoba oil, olive oil, castor oil, or the grain germ oils, such as wheat germ oil;

various oily esters derived from a long-chain acid and/or alcohol, such as purcellin oil, isopropyl, butyl or cetyl myristate, isopropyl, butyl or ethyl-2-hexyl palmitate, decyl oleate, hexyl laurate, propylene glycol dicaprylate, diisopropyl adipate, and the mixtures of  $C_{12}$ - $C_{15}$  benzoic esters commercially available under the tradename FINSOLV TN from the firm of WITCO;

the animal oils, such as perhydrosqualene;

the silicone oils, such as the dimethylpolysiloxanes, phenyldimethicones, cyclomethicones, and alkyl dimethicones;

the long-chain alcohols, such as the oleyl, linoleyl, linolenyl, and isostearyl alcohols, or octyl dodecanol;

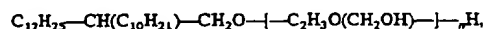
the esters derived from lanolic acid, such as isopropyl or isocetyl lanolate; and

the acetyl glycerides, the octanoates and decanoates of alcohols, or of polyalcohols (especially of glycol or glycerol), and the ricinoleates of alcohols or of polyalcohols, e.g., cetyl ricinoleate.

In general, the instant copolymers are soluble in oils with the exception of certain silicone oils used alone. When the copolymer is not sufficiently soluble in oil, it may be possible to attain the desired viscosity as described above by using an organic cosolvent which is compatible with cosmetologic use. Representative cosolvents include, but are not limited to, ethanol, propanol, isopropanol, glycerol, and propylene glycol. The co-solvent is usually added directly to the oil and, in the case of an emulsion, before mixing with aqueous phase of the emulsion. Generally, the amount of co-solvent is not greater than 30 volume percent relative to the volume of the oil.

The instant copolymers can be used to thicken the oil in a composition of any form, including without limitation water-in-oil emulsions, oil-in-water emulsions, anhydrous compositions, and gelled oils.

The instant copolymers can be used to thicken compositions containing a water-in-oil type emulsion. When the instant copolymers are used in this type of system, a conventional emulsifying agent or surfactant may be added to provide a stable emulsion. Any emulsifying agent known in the art and compatible with cosmetologic usage may be employed in the instant invention. Such agents include, but are not limited to, glycerol isostearate such as IMITOR 780K (commercially available from Dynamit Nobel) and polyglycerol ethers having the formula:



wherein  $n$ =an integer from 2 to 15 and described for example in French patent application 87.00 878 (2.593.509). The amount of the emulsifying agent is known in the art, but is generally in the range of up to about 15% by weight of the composition.

The instant copolymers may also be used to thicken compositions of the neat type; that is, those compositions which do not contain a substantial amount of water. Such neat compositions include, for example, creams and gels.

The compositions of the instant invention further may optionally contain a rheology control agent to improve the properties of the thickened oil composition if deemed necessary or desirable. This especially applies to the case in which the composition obtained is too viscous and tends to be brittle or is less viscous but not pliable enough and very fluid. These rheology control agents are known in the art and in general are nonionic amphiphilic agents having an HLB value between about 12 and about 40. They are preferably used in the presence of water or a water-soluble alcohol. The rheological control agents include: the esters of fatty acids and polyoxyethylene sorbitan; the esters of fatty acids and polyoxyethylene glycerol; the esters of fatty acids and polyoxyethylenepropylene glycerol; the polyoxyethylene or polyoxypropylene alkyl ethers; the polyoxyethylene or polyoxypropylene alkyl phenyl ethers; and the polyoxyethylene Guerbet alcohols.

When the compositions of the instant invention are cosmetic compositions, they may optionally contain additives conventionally used in the cosmetic industry, including but not limited to active ingredients, perfumes, preservatives, and sunscreen agents. These additives and their use in cosmetic compositions are well known in the art and can be added by known techniques before, during, or after the thickening of the oil.

Various active lipophilic substances which are beneficial for the skin, such as tocopherol and its esters, the fatty esters of ascorbic acid, 18- $\beta$ -glycyrhethinic acid, the ceramides, screening substances absorbing ultraviolet light, antioxidants, etc., also may optionally be incorporated in the oils.

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